

# Attention Based Time-Series Upscaling

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# Overview

- ▶ *Background*
- ▶ Methodology
- ▶ Results
- ▶ Future Work

# Background

- ▶ Growth in compute speed in supercomputers is out pacing growth in IO speed and storage by 10 to 1.
- ▶ Supercomputers are generating so much data so fast that we cannot save it fast enough and do not have enough storage to save high resolution time series data.
- ▶ Simulation science is exploratory by nature. We don't always know what we want a priori (beforehand)
- ▶ Interesting events can happen between save states.

# What We Need

- ▶ Need to be able to explore the simulation in situ.
- ▶ Need to be able to extract information across large time steps while saving data infrequently.

# What Has Been Done

- ▶ Conventionally scientists LERP between timesteps.
- ▶ Current research is into different machine learning models to infer data between timesteps.

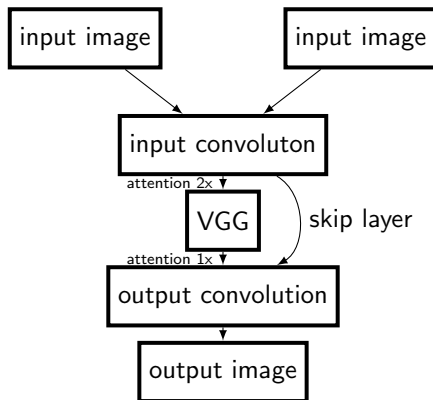
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# Methodology

- ▶ Generative based machine learning models are a promising avenue for time-series upscaling.
- ▶ Attention based networks are shown to be highly parallelizable and able to "remember" features through time-series data.
- ▶ Convolutional Neural Networks (CNNs) are computationally efficient and have proven effective in working with images.
- ▶ Model uses CNNs, skip layers, and self-attention to generate time-series upscaling.

# Model





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# Results

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# Future Work

- ▶ Adapt so step size is modifiable (e.g. 30% from Image 1 and 70% from Image 2.)
- ▶ Fine tune model to be more efficient.
- ▶ Use online learning methods.